$\therefore$ by (1) A's portion $= \frac{1}{3}(400+000+200) = 200,$
" (2) B's portion $= \frac{1}{3}(000+300+000) = 100,$
" (3) C's portion $= \frac{1}{3}(000+100+200) = 100.$
Net estate $(d) = \$400.$

PROBLEMS.

250. By L. REGAN, *Boonsboro, Iowa.*—Divide the line AB, geometrically, into three parts that shall be in harmonic proportion.

251. By DR. H. EGGERS, *Milwaukee, Wisconsin.*—Show that when the two lines, which bisect two angles of a triangle, are equal the triangle is isosceles.

252. By W. E. HEAL, *Wheeling, Ind.*—If the roots of a given cubic equation be not *real* and *positive* show that the equation can be transformed into another, of the same degree, in which *all* the roots are real and positive.

253. By PROF. E. J. EDMUNDS, *New Orleans, La.*—If $f(x)$ be a function whose roots are all real, show that the differential of the second order of that function has all its roots imaginary.

254. By ARTEMAS MARTIN, M. A., *Erie, Pa.*—Integrate

$$dI = xE(e, x)dx,$$

where $E(e, x)$ denotes an elliptic arc, eccentricity e and abscissa x.

255. By PROF. JOHNSON.—1. In a triangle ABC the angle $A=\varphi+\alpha$, $B = 2\varphi$; supposing AB to remain fixed, while φ varies, it is required to find the rectangular equation to the locus of C, and the equations to the asymptotes.

2. With the same data as above, taking A as the origin, and AB as the axis of x; let $\alpha = 45°$, and find the envelop of a straight line which passes through C and makes an angle $4\varphi+90°$ with Ax.

256. By PROF. H. T. EDDY, *Cincinnati, Ohio.*—If the given quantities x_1, x_2, x_3, x_4 have the probable errors r_1, r_2, r_3, r_4, respectively, find the probable error r of the quantity x when $x_1 : x_2 :: x_3+x : x_4+x$.

257. By E. B. SEITZ, *Greenville, Ohio.* — Within a triangle ABC, determine a point P, such that $m.PA+n.PB+r.PC$ shall be a minimum, m, n, r being constants.

258. By J. M. ARNOLD, *Boston, Mass.*—The Balance of a watch is slightly heavier on one side than on the other. When the watch is placed vertically with the pendant up, the heavy point is at the lowest side when the balance is at rest.

If the watch be started with a small arc of vibration the rate will be much faster, in the vertical position, with the pendant up than with the pendant down. If the motive power be increased so that the arc of vibration becomes large, say one and a half revolutions or 270° each side the point of rest, it will be found to go faster, in the vertical position, pendant down than it does with the pendant up.

What arc of vibration must be given the balance, so that its rate shall be the same in any vertical position?

QUERY 1. By PROF. HALL.—When we descend below the surface of the Earth, does the Earth's attractive force increase or diminish?

QUERY 2. By MR. KUMMELL.—Let $\cos^2\varphi$ be the probability of a single event, hence $\sin^2\varphi$ that of its non-occurrence. Supposing m simultaneous events of either kind, then we have for the mean square of the difference in number, after an infinite number of trials, the expression:

$$\varepsilon_m^2 = \cos^{2m}\varphi(m)^2+\frac{m}{1}\cos^{2m-2}\varphi\sin^2\varphi(m-2)^2+\frac{m}{1}\cdot\frac{m-1}{2}\cos^{2m-4}\sin^4\varphi(m-4)+..$$

$$+\frac{m}{1}\cdot\frac{m-1}{2}\cdots\frac{m-n+1}{n}\cos^{2m-2n}\varphi\sin^{2n}\varphi(m-2n)^2+\ldots\sin^{2m}\varphi(-m)^2=m(\sin^2 2\varphi+m\cos^2 2\varphi)$$

Since $m(\cos^2\varphi-\sin^2\varphi) = m\cos 2\varphi$ is the most probable difference in the number of the two kinds of events, we have $\sin 2\varphi\sqrt{m}$ for the mean error with respect to the most probable difference. How is this proved otherwise than by induction?

PUBLICATIONS RECEIVED.

Physical and Mathematical Principles of the Nebular Theory; 10 pages, 8vo:
The Origin of the Power which Causes the Stellar Radiations; 10 pages, 8vo:
Elements of Sidereal Astronomy; 7 pages, 8vo: By JACOB ENNIS, A. M., Professor of Natural Science in the State Normal School, Shippensburg, Pa.

ERRATA.

On page 47, line 5, insert $\frac{1}{2}$ before the sign of integration.
" " " " 7, multiply the term under the sign of integration by $d\phi$.
" " " " 9, for n—3, read n—2.